Appl. No.: 10/037,461
Amdt. Dated: February 23, 2004
Reply to Office Action of: November 24, 2003

REMARKS/ARGUMENTS

Claims 1 - 33 remain in this application. Claims 1, 2, 6, 11, 13, 20, 22, and 26 have been amended to overcome § 112 Rejections.

1. Drawings

The Examiner has not indicated in the accompanying form PTO-948 that the formal drawings previously submitted have been approved. Without a specific rejection from the Examiner, Applicant will deem them as accepted.

2. § 112 Rejections

The Examiner has rejected claims 1 - 33 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out or distinctly claim the invention.

With respect to independent claims 1, 11, and 20, the Examiner alleges that the claims fail to define the structural relationship between the active layer and the current-induced grating. All of the independent claims have now been amended for overcoming this rejection by defining the structural relationship between the active layer and the current-induced grating such that the periodically spaced current-induced grating disposed near the active layer modulates gain in the active layer in the direction of light propagation for providing periodic modulation of the gain of the active layer and periodic modulation of a differential refractive index between the different indices of the active layer and of the periodically spaced current-induced grating to determine a wavelength of a light emitted from a laser cavity formed from the length L of the active layer. An electrical contact over the periodically spaced current-induced grating is further recited for providing current to the grating to control the wavelength of the light emitted from the laser.

In the Application, single mode operation is described on page 2, lines 22-28 in the section on summary of the invention. The device uses a grating that is complex. The grating has a real and imaginary index component. The grating structure is located near the gain structure and injects the current into the gain region to induce a spatial

modulation in the gain material with the same pattern as the grating. The device does not depend on reflection from the cleaved facets to break the symmetry of the two degenerate laser modes.

The method for introducing an electrical signal (temporal) pattern on the laser diode is described from page 4, line 27 to page 5, line 6. The layout is further illustrated in figure 1. As described in the text, a temporal current pattern from the injection controller 116 drives the entire semiconductor laser.

Single mode operation is described from page 6, line 28 to page 7, line 7 in the section on detailed description of the invention. The section describes how the grating pattern in the narrow bandgap material (20) results in a conductivity pattern that creates a current pattern in the nearby gain (active) material. This results in spatial modulation in the gain that is similar to the index modulation from the grating material. The result is a gain and index (imaginary and real) grating pattern that is complex. The gain pattern causes one of the two possible Bragg modes from the grating to be excited. The grating can be made very strong, large κL. Therefore, the reflection from a facet or outside source does not play an effect in selecting the Bragg mode.

The structural relationship and interaction is also described in detail from page 6, line 24 to page 7, line 7 and can be seen in Fig. 2. The text clearly describes the relationship between the spacing of the grating and the emitted wavelength as $\lambda/2n$ where λ is the emitted wavelength and n is the effective index of the optical waveguide.

On page 6, lines 28 through 31 clearly describe the structure of a complex coupled DFB laser. From page 6, line 31 to page 7, line 8 the physical mechanisms during operation of the complex coupled structure are described. The optical mode of the laser cavity is described on page 7, lines 8-16. The length of the cavity can be taken as the length of the chip as shown in figure 2.

3. § 102 Rejections

The Examiner has rejected claims 1 – 4, 6, 10 – 15, 20 – 24, 26, and 30 – 33 under 35 U.S.C. § 102(a) as being anticipated by Huang, et al (Isolator-free 2.5-Gb/s 80 km transmission by directly modulate $\lambda/8$ phase shifted DFB-LDs under negative

feedback effect of mirror loss, IEEE Photonics Technology Letters, Vol. 13, No. 3, March 2001).

The Examiner asserts that with respect to claims 1, 3, 4, 6, 10 – 12, 14, 15, 20, 21, 23, 24, 26, and 30 – 33 Huang disclosed a current induced grating with a coupling strength greater than 3. However, as seen in Huang's Fig. 3, the center Huang's grating is not periodically spaced as seen in the Applicant's FIG. 2 when compared to the rest of his grating spacing. Instead Huang's gratings have extra spacing in the center to form a $\lambda/8$ phase-shift region.

Therefore, Huang et al., describes a phase shifted grating structure rather than the Applicant's current injected complex coupled gain structure. Please note that in Huang's figure 3, a phase shift region is indicated. The crux of the Huang paper is the proper selection of the amount of phase shift to make the laser diode immune to external feedback and suitable for isolator free operation. Figure 2 of Huang presents the calculated performance difference that results from changing the amount of phase shift. In contrast, Corning is presenting the use of a complex coupled grating structure using current injection. The Corning structure does not have a phase shifted region. The Huang paper teaches the use of a phase shifted region with a properly selected amount of phase shift for isolation free performance. The Huang paper does not anticipate the use of a complex coupled grating through current injection to produce isolation free performance. Huang shows in figure 3, a $\lambda/8$ phase shifted DFB-LD. Huang's device is not a current induced complex coupled grating structure. It is clearly an index coupled grating with a phase shifted region. Therefore, Huang's paper does not anticipate a current induced complex grating device. All of the Applicant's claims are based on current-induced gratings to produce a single mode output. (See claims 1, 11 and 20.)

In paragraph III, first column, line 6, Huang only disclosed a "normalized coupling coefficient κL was about 3." About 3 does not mean greater than 3.

Because Huang does not anticipate the Applicant's periodically spaced gratings recited in all of the independent claims (which are carried in all dependent claims) nor its strong grating strength greater than 3 in dependent claims 2, 13, and 22, the Applicant

respectfully requests that the examiner remove his §102(a) rejections of 1 – 4, 6, 10 – 15, 20 – 24, 26, and 30 – 33.

4. § 103 Rejections

The Examiner has rejected claims 5, 7 – 9, 16 – 19, 25, 27 - 29 under 35 U.S.C. § 103(a) as being unpatentable for obviousness over Huang, et al (Isolator-free 2.5-Gb/s 80 km transmission by directly modulate λ/8 phase shifted DFB-LDs under negative feedback effect of mirror loss, IEEE Photonics Technology Letters, Vol. 13, No. 3, March 2001) in view of Welch, et al (US2003/0095737).

Neither Huang nor Welch suggests the use of current-induced complex coupled gratings and there is no motivation in either the reference to combine the references, whose combination, even if possible, would still not produce current-induced gratings.

With respect to claims 5, 16, and 25, the Examiner asserts that Huang discloses all limitations of the claims except for the quantum well structure is AlInGaAs. Although AlInGaAs quantum wells can be used by Huang, it is unique that Corning proposes the use of current induced complex grating.

With respect to claims 7-8, 17-18 and 27-29, the Examiner asserts that Welch discloses an electro-absorption modulator 14 (Fig. 4). Furthermore, with respect to claims 9, 19, and 29, the Examiner asserts that Welch discloses a Mach Zehnder modulator (para. 0035). However, Welch does not disclose a method for allowing operation of the devices without the use of an optical isolator. Welch does not disclose the use of a current-induced complex grating to provide for isolator free optical performance. Therefore, the use of current-induced complex gratings provides a new path to making devices that integrate lasers and modulators without optical isolators. Because the references, by itself or in combination, do not teach a current-induced grating, the claims should be patentable over the cited references.

Based upon the above amendments, remarks, and papers of records clarifying current-induced gratings, applicant believes the pending claims of the above-captioned application are in allowable form and patentable over the prior art of record. Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

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Applicant believes that no extension of time is necessary to make this Reply timely. Should applicant be in error, applicant respectfully requests that the Office grant such time extension pursuant to 37 C.F.R. § 1.136(a) as necessary to make this Reply timely, and hereby authorizes the Office to charge any necessary fee or surcharge with respect to said time extension to the deposit account of the undersigned firm of attorneys, Deposit Account 03-3325.

Applicant requests the Examiner to acknowledge receipt of the Revocation and Substitute Power of Attorney mailed June 24, 2003. Applicant also requests the Examiner to please direct any questions or comments to Juliana Agon at 607-974-6574.

February 23, 2004
Date

CERTIFICATE OF TRANSMISSION UNDER 37 C.F.R. § 1.8

I hereby certify that this paper and any papers referred to herein are being transmitted by facsimile to the U.S. Patent and Trademark Office at 703-872-9306 on:

February 23, 2004
Date

Juliana Agon 2/23/04
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Respectfully submitted,
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